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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

Tomohiro Ishikawa, et al

OPTICAL COMPENSATION FILM,
DISPLAY AND PROCESS

Serial No. 10/796,746

Filed 09 March 2004

Group Art Unit: 2871

Examiner: Zhi Qiang Qi

I hereby certify that this correspondence is being deposited today with the United States Postal Service as first class mail in an envelope addressed to Commissioner For Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

Deldra L. Mack

December 11, 2006

Date

Commissioner for Patents
P.O. Box 1450
Alexandria, VA. 22313-1450

Sir:

DECLARATION UNDER RULE 132

The undersigned, Dennis J. Massa, declares that:

He received the degree of B.S. in Chemistry from Bradley University, Peoria Illinois, in 1966;

He received the degree of PhD in Physical Chemistry from the University of Wisconsin, Madison Wisconsin, in 1970;

He completed Post Doctoral work in Physical Biochemistry at the University of California at San Diego in 1970-71;

He has been employed by Eastman Kodak Co. since 1971 as a research scientist involved in optical materials;

He is a co-inventor in the above-captioned patent application;

He has reviewed the outstanding Office Action and any applicable cited references;

Under his direction and control, the following experiments were conducted:

1. Polymers.

Samples of various polymers listed in Table I in varying mole fractions were obtained. The polymers sourced from Eastman Kodak were prepared using the preparation method for Polymer 1 in the patent application, which is given in detail in the application. The polymers obtained from Bayer, A.G. were used as received.

2. Determination of glass transition temperature (Tg).

The glass transition temperature, Tg, for each polymer was determined using a Perkin-Elmer Differential Scanning Calorimeter Model DSC-7 using a heating rate of 20°C/min. The Tg was taken as the midpoint in the baseline transition in specific heat between the glassy and rubbery states using methods known to those skilled in the art. All were amorphous, glassy polymers, as proved by the absence of any melting peaks or thermal transitions except for their Tg. Tg values are recorded in Table I.

3. Determination of the out-of-plane (OOP) birefringence for polymers listed in Table I.

A 9% solution of each polymer was prepared in a suitable solvent such as dichloroethane or n-propylacetate. A film was made by spin casting onto a 2" X 2" glass plate using a Headway Research, Inc. (Garland, Texas) Model CB15 spin coater operating at speeds from 1000 to 3250 rpm. The resulting film was allowed to dry overnight and was then raised to 85°C for a few minutes, thus removing a substantial majority of the solvent. The final drying temperature was chosen to be high enough to remove a substantial majority of the solvent, but still below its glass transition temperature, Tg. The film's properties were analyzed by an ellipsometer (model M2000V, J.A. Woollam Co.) at $\lambda = 550\text{nm}$. The out-of-plane birefringence was analyzed by the instrument using methods known to those skilled in the art.

4. Conclusions

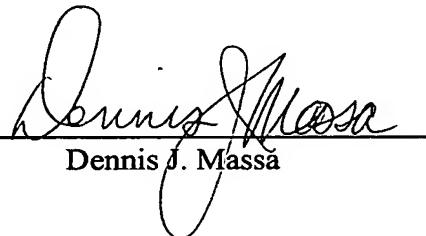
A. The data in the table shows the significance of employing an amorphous polymer having a Tg of at least 180°C when a high negative out of plane birefringence is desired. Comparative Examples Nos. 2, 3, and 4 have glass transition temperatures, or Tg, of 100°C, 100°C, and 149°C, respectively; yet their OOP birefringence values are only -0.0014, -0.0014, and -0.0030, respectively.

However, in comparison, every amorphous polymer example shown in Table I whose Tg is above 180°C has an out-of-plane (OOP) optical birefringence that is more negative than -.0100. In general, the higher the Tg above 180°C, the more negative the OOP birefringence.

B. It is typical in my experience that the use temperature of an optical polymer might extend up to 40 °C. This is about 100°F. This is barely above room temperature compared to 180°C which is about 355°F. It is apparent when reviewing the data for the examples listed in Table I that it is not nearly sufficient that the glass transition temperature Tg be above the use temperature for LCD displays. Temperatures at and above the boiling point of water are generally too low in negative OOP.

The undersigned declares further that all statements made herein of the undersigned's own knowledge are true and all statements made on information and belief are believed to be true. These statements are made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Date: December, 2006



Dennis J. Massa



TABLE I
Out-of-plane birefringence vs. Amorphous Polymer Tg for solvent-cast polymer films.

| Example Number | Polymer | Source | Tg (°C) | OOP Birefringence (550 nm) |
|-----------------------|---|---------------|---------|----------------------------|
| Comparative Example 1 | Poly(ethylene-co-hexylene naphthalate) | Eastman Kodak | 91 | -0.0065 |
| Comparative Example 2 | Gelatin | Eastman Kodak | 100 | -0.0014 |
| Comparative Example 3 | TAC | Eastman Kodak | 100 | -0.0014 |
| Comparative Example 4 | Poly(4,4'-hexafluoroisopropylidene-bisphenol-co-(4,4'-isopropylidene) bisphenol) terephthalate-co-isophthalate. | Eastman Kodak | 149 | -0.0030 |
| Comparative Example 5 | Poly(ethylene-co-((4,4'- hexahydro-4,7-methanoindan-5-ylidene) bis(1,4-phenyleneoxy)bisethanol) terephthalate-co-isophthalate | Eastman Kodak | 154 | -0.0100 |
| Inventive Example 1 | APEC 9350 aromatic polycarbonate | Bayer A.G. | 189 | -0.0103 |
| Inventive Example 2 | Poly(4,4'-hexafluoroisopropylidene-bisphenol) terephthalate-co-isophthalate | Eastman Kodak | 198 | -0.0183 |
| Inventive Example 3 | APEC 9371 aromatic polycarbonate | Bayer A.G. | 206 | -0.0112 |
| Inventive Example 4 | Poly(4,4'-hexafluoroisopropylidene-bisphenol) terephthalate-co-isophthalate | Eastman Kodak | 236 | -0.0310 |
| Inventive Example 5 | Poly(4,4'-hexafluoroisopropylidene-2,2',6,6'-tetrachlorobisphenol) terephthalate-co-isophthalate | Eastman Kodak | 250 | -0.0233 |
| Inventive Example 6 | Poly(4,4'-isopropylidene-bisphenol) 1,1,3-trimethyl-3-phenylindan-5,4'-dicarboxylate | Eastman Kodak | 250 | -0.0148 |
| Inventive Example 7 | Poly(4,4'-hexafluoroisopropylidene-bisphenol) 1,1,3-trimethyl-3-phenylindan-5,4'-dicarboxylate | Eastman Kodak | 252 | -0.0152 |
| Inventive Example 8 | Poly(4,4'-hexahydro-4,7-methanoindan-5-ylidene) bisphenol carbonate | Eastman Kodak | 262 | -0.0104 |
| Inventive Example 9 | Poly(4,4'-hexafluoroisopropylidene-bisphenol-co-(4,4'-hexahydro-4,7-methanoindan-5-ylidene bisphenol) terephthalate -co-isophthalate | Eastman Kodak | 274 | -0.0369 |
| Inventive Example 10 | Poly(4,4'-hexafluoroisopropylidene-bisphenol-co-(4,4'-hexahydro-4,7-methanoindan-5-ylidene) bisphenol) terephthalate-co-isophthalate. | Eastman Kodak | 278 | -0.0289 |
| Inventive Example 11 | Poly(4,4'-hexahydro-4,7-methanoindan-5-ylidene bisphenol) terephthalate | Eastman Kodak | 291 | -0.0218 |